EQUIPMENT DEVELOPMENT GRADE EVALUATION GUIDE
PART II—PROJECT MANAGEMENT ENGINEERING

Position Description

Factor I - Scope of Assignment

Scope will be addressed in three aspects: product capability, supported users, and incumbent's responsibilities.

The incumbent is responsible for developing a system that facilitates management of experimentation-related information through the entire research process. The project focus is to support the Wind Tunnel Enterprise at Langley, but the resulting system should be able to support all NASA programs that require experimentation. It is anticipated this system will support thousands of users. Supported processes include test planning, design, scheduling, simulation, team communication and management, test execution and monitoring, document management, and data archiving, search, and retrieval. The system supports very high levels of data security and reliability. To reduce the potential for mistakes, the system must maximize the sharing of information between components to minimize manual entry of information. A support structure provides on-going user support and system maintenance.

Target users are experimentalists using NASA's ground-based test facilities. These include NASA civil servants, permanently badged contractors, and external customers. Facility operations, model design and manufacturing, instrument calibration and repair, data system operation, data quality assessment, test team management, facility management, data analysis, project management, and test-technique development are all supported. The system is adaptable to all test facilities, centers, and agencies. The system anticipates expansion into the commercial and academic sectors as it gains broad acceptance within NASA.

The incumbent's responsibilities span requirements definition, software development, and product marketing. This includes strategy, planning, resource acquisition, management, assessment of capabilities, integration of existing tools, developing non-existent tools, system implementation, and training. The incumbent performs program advocacy. She applies her management experience, team leadership skills, computer science knowledge, experimentation experience (aerodynamic and structural), interpersonal skills, and a network of contacts in the research community. The incumbent acquires and evaluates contractor services.

Factor II – Technical Complexity of the Assignment

Technical complexity stems from several aspects. The supported area is state-of-the-art aerospace research. The delivered system supports all NASA programs that involve experimentation. These programs are exceptionally broad, are rapidly changing, and have conflicting requirements. The supported programs require high levels of security and system reliability, driving the development cycle to a higher "technology readiness level" than is customary in NASA development efforts. Additionally, to support ease of use and familiarity, the components used to build the supporting system are either existing systems developed with no consideration for integration or must be custom-developed using cutting-edge computer based technologies, typically unproven, and whose longevity must be predicted. The incumbent manages the risks and conflicts these complications create. Past attempts to develop a similar system have been costly and unsuccessful, so successful completion of this system will necessarily advance the state of the art. Cultural differences among NASA Centers and between NASA and DoD make market expansion challenging, as well.

Factor III – Responsibility and Authority

The incumbent has the responsibility of developing and deploying a system that receives broad acceptance in the research community of NASA by greatly enhancing the effectiveness of research teams and research facilities. This is done in an environment of declining budgets, particularly for research facilities. Negotiated deliverables are satisfactorily completed in exchange for all funding that is secured by the incumbent. This is because the incumbent is also responsible for maintaining the good reputation of IGEB in the eyes of all programs approached as a representative of IGEB.

The incumbent has been given the general guideline of exploiting state-of-the-art IT components to the maximum advantage of the research community at Langley and the developed system must be designed to allow easy application to other NASA centers and, possibly, to other research organizations. The incumbent requests Information Gathering and Empowering Branch (IGEB) workforce from the Branch Head but has full authority beyond these guidelines. This authority includes:

- establishing overall operating policies, priorities, procedures and long and short-range plans;
- exercising broad authority regarding programming of effort, delegation of authority and responsibility, allocation of overall resources, insuring of functional support, approval of critical actions and changes, and continuing managerial appraisal of progress coupled with authority to require appropriate corrective actions;
- serving as an authoritative source for decisions and guidance concerning compromises and changes in program objectives relating to management of the total project effort. Such determinations are reviewed for the purpose of keeping higher levels of management informed on the status of the project.

Factor IV – Technical and Managerial Demands

Although not a supervisor, the incumbent assembled and leads a team capable of accomplishing the technical objectives associated with producing a system that significantly increases efficiency in the research community. The membership of the team changes as the system's use expands. A full-time technical expert was provided from IGEB staff and the incumbent was consulted in performance planning, rewards and recognition for that employee. No IGEB funds are available for this project beyond funding necessary for administrative support. The incumbent seeks and secures additional funding and support elsewhere. This is particularly challenging when facility funding is declining. The rapidly changing customer base (both the programs and the facilities that set the requirements) and the rapidly changing computer field (resources for fulfilling the requirements) present additional challenges. Though cultural resistance will be encountered in all stages of implementation, the President's e-Government Initiative and the "One NASA" directive make it clear that a single research information management system will be adopted as an Agency standard. The Ames Research Center, NASA's Center of Excellence for IT, will be the logical choice for developing such a standard. Having Langley's legacy components included provide obvious advantages. Perhaps the greatest challenge facing the incumbent is to assure that Langley lead the development effort and maintain Ames partnerships. Failure to develop a system that significantly enhances the efficiency of research teams could result in greater facility closures and could jeopardize NASA's research programs.

Employee Accomplishment Record

1. Name - Meryl T. Forrest

2. Education

1986	ME in Flight Sciences from Virginia University
1968	Courses towards Ph.D. in mathematics at Tennessee University
1967	Course work towards Ph.D. in mathematics at the University of Minnesota
1966	MA in Mathematics from North Dakota University
1964	BS, cum Laude, in mathematics from Florida University

3. Relevant Professional Training Received

2002	PS-8 Critical Chain *Multi-Project Planning*
2000	*OPM Class: Management of Information Technology*, Requirements Definition Class; WebObjects Training Class;
1992	LabView 2; Neural Networks
1988	Hypersonic Aerodynamics
1987	Transonic Unsteady Aerodynamics

4. Professional Experience

Present Assignment

Dates (From: March 1999 To: Present)

spaceNAV **Project Leader/Developer**

As team lead for this project, I have overall responsibility for developing, deploying and commercializing *spaceNAV*, a web-centric, information management system and experimentalist's tool set that both 1) facilitates the management of experimental information throughout the entire research process and 2) is capable of improving the efficiency of research throughout the agency. As such, I am responsible for all aspects of the project as identified in the Position Description, above. These range from securing funding to marketing the finished product. In addition, I personally developed major software components for the system. Successful deployment of this system in the wind tunnels at Langley is critical to the mission of the Information Gathering and Empowering Branch. Developing a system that is mature enough and capable enough to commercialize is key to achieving the branch's desire to have this system become the industry standard.

(100% time spent on *spaceNAV* Project: 50% management duties as described above, 30% system development, 20% training.)

Supervisor: Ray B. Grafton — Project Chief: Ralph Wise

Previous Professional Positions

Dates (From: February 1998 To: March 1999)

Data Acquisition Systems Coordinator for the Research Facilities Branch

Served as lead to coordinate the Data Acquisition Systems (DAS) information management processes for the eight major wind-tunnel facilities in RFB. Served as the lead for the development of test execution management tools that support the test execution process. Supervisor: Manny A. Kidd

Dates (From: March 1994 To: February 1998)

Data Acquisition System Manager for the Transonic Dynamics Tunnel (TDT) and Aeroelasticity Branch

Served as the Data Acquisition System (DAS) manager for the TDT. Assure continuous operation to support all tests; manage all system development to assure development of state-of-the-art DAS to meet the future needs of the facility.

Dates (From: March 1989 To: May 1998)

Digital Controller System Designer and Implementer for the Aeroelasticity Branch

Served as the lead designer and developer of a digital controller for active control of models to support aeroservoelastic research.

Dates (From: March 1993 To: May 1998)

Test/Research Engineer for the Aeroelasticity Branch

Served as a lead test engineer and researcher for Benchmark Active Controls Testing (BAirplane CompetencyT)

Dates (From: March 1993 To: May 1998)

Group Leader for Experimental Testing Support Group in the Aeroelasticity Branch

Served as a group leader in managing Experimental Testing Support activities.

5. Significant Scientific/Engineering/Technical Accomplishments

I have had an extremely diverse career at Langley. After teaching mathematics at Bowler University in New Hampshire for eight years, I first began working at Langley as a contractor doing scientific programming in flight dynamics and controls. Starting in the 1970's as a contractor and continuing through the late 1980's as a NASA civil servant, I developed software tools for the analysis of aeroeservoelastic (ASE) phenomena and for designing control laws for actively-controlled aircraft, using non-linear optimization techniques (refs. 10.a.1.9 - 10, 10.a.2.10, 10.a.2.13 - 15, 10.a.2.17– 19, 10.a.3.9, and 10.a.3.13). During the mid to late 1980's I expanded my research in the modeling of the unsteady aerodynamics and developed codes to perform aeroservoelastic modeling (ref. 10.a.1.6 – 8, 10.a.2.11 – 12, 10.a.3.3 - 5). During the years 1989 to 1998 I worked to develop a multi-function, multi-input/multi-output digital controller and the on-line analysis capabilities required to assess open- and closed loop stability while performing ASE investigations in the wind tunnel. I also participated in a number of tests to experimentally validate ASE methodologies and verify ASE codes. During this time I co-authored two NASA TPs (refs. 10.a.1.4 and 6), five papers for archival journals (refs. 10.a.1.1 – 3, 10.a.1.5, and 10.a.1.7), four NASA TMs (refs. 10.a.2.4 - 6, and 10.a.2.8 - 11), eleven conference papers (refs. 10.a.2.1 - 11), and two Workshop papers (refs. 10.a.3.1 - 2.

During this same period of time, I served as a lead test engineer and lead research engineer for two tests of the BAirplane CompetencyT model. As such, I managed the planning, testing, data acquisition, reduction, delivery, and analyses throughout the test cycles for both the primary DAS and the Active Digital Controller used for the test. I also managed the design, fabrication, construction, and modeling of the servo-controller mechanism required to attain the frequency responses necessary to support flutter suppression for the BAirplane CompetencyT model. I also served as a research engineer supporting tests for active flutter suppression of a Piezoelectric-actuated flexible wing, and buffet reduction of an F-18 model using both traditional and piezoelectric-actuated controls.

Because of my work with digital controllers and the integrated data acquisition and analysis required to perform ASE investigations, I requested the task of managing the Data Acquisition System when the opportunity arose. A new system was under development to replace the aging system currently in place. I led a team effort that brought new ideas and new on-line analysis capabilities into control room, providing the customer with near real-time dynamic analyses of all data within minutes of acquisition. This involved the coordination of both NASA Civil Servants and contractors. To maintain system integrity and reliability, the new system was brought on-line and verified while still running the pre-existing system. Although some unanticipated down time ensued, it was minimal. The new system was ready for final installation in time for a major calibration effort after a CofF. In fact, the primary integrated data acquisition system and dynamic analysis package was actually ready ahead of schedule and was used to support a test in the 14x22 during the CofF. The experiences learned at the TDT carried over to my work in the Research Facilities and the Information Gathering and Empowering Branches of the Airplane Competency. They gave me the expertise in the several technical areas required to develop an integrated information management system that included tunnel control and data acquisition systems, and for developing programs for future facility hardware and software enhancements.

I have received two Dual Career Ladder Awards, five Quality Step Increases, six Superior Achievement Awards, three Special Achievement Awards, three NASA Certificates of Recognition from the Inventions and Contributions Board, one Director's Award from the U.S. Army, and two Team Excellence Awards, one NASA Group Achievement Award, and seven certificates of outstanding performance for the work described above.

I consider the following as my three most significant accomplishments during the past 11 years.

5.1 *spaceNAV* advances the state-of-the-art for test process support across the Agency

spaceNAV is a complex system with a broad scope. It supports pretest planning, test design and simulation, resource scheduling, team communication and management, test setup, execution and monitoring, document management, and data delivery, archive, search and retrieval. *spaceNAV*, improves the entire aerospace research process by facilitating information management for ISO 9001 compliance and automating capture of meta-data to extend the meaningful life expectancy of experimental data. A high level of security and system reliability is supported. To assure smooth operation during test execution, the tools that directly support test execution can be run in a stand-alone mode should a network failure occur. Built-in recovery options are available once network service to the databases is re-established. Except for the archive management system, the entire set of fully integrated tools runs on an independent server that can be placed in the control room to support classified tests.

Because of the nature of the programs being supported, unusually high levels of security and system reliability must be maintained. This requirement has driven the development cycle to a higher "technology readiness level" (TRL) than is customary. All data transfer is via the highest level of encryption available today. Firewalls and user authentication provide added security. *spaceNAV* maximizes the sharing of information between the integrated tools to reduce the potential for mistakes by minimizing the manual entry of shared information. A support structure is being developed to provide on-going user support and system maintenance. Targeted users include an extremely diverse group of customers both internal and external to NASA.

spaceNAV

- Directly improves administrative, technical, and research processes required in developing advanced aircraft
  - substantial improvement in the administrative support processes for wind-tunnel testing
  - promotes the ability to efficiently plan, simulate, set up, and conduct a wind tunnel test
- Supports ISO 9001 processes with
  - automated information gathering
  - standardized repositories for supporting information
- Produces more reliable information with 'Write Once / Read Many' support
- Automates meta-data capture to extend the life of experimental data for future analyses
- Reduces the total test-cycle-time up to 25%
- Reduces the test-design-cycle-time by 50 to 90%
- Extends the meaningful life-cycle-time for test archival data by decades

spaceNAV provides information management for functions performed by facility operators, model designers and manufacturers, instrument calibration and repair technicians, data system and data quality specialists, test engineers, facility managers, researchers, project managers, and test-technique developers. Initial deployment of the system targeted the 14x22ft Subsonic Tunnel, the National Transonic Facility, 0.3m Transonic Cryogenic Tunnel, and the Low Turbulence Pressure Tunnel at Langley. It has expanded to 27 other facilities in the Wind Tunnel Service Activity and has gained widespread use by team members from all other NASA centers. The collaborative tools have found universal appeal to project groups outside the testing environment, including the Management Support Office, Systems Engineering Office, Inventions and Contributions Board, NASA Technical Standards Program, as well the AIAA Systems Engineering Technical Committee. A cooperative agreement with Arnold Engineering Development Center has been established for future development. The next phase of development will result in a highly configurable system that can be readily adapted for use in the commercial market.

The *spaceNAV* system has had 99.8% availability since its initial release in March 2001 and is becoming a recognized standard across the Agency.

spaceNAV

- is groundbreaking in the way it synergistically integrates a set of existing, isolated tools with a set of custom-developed tools
- provides a unique set of information management tools that support the entire research process
- is an innovative blending of new system components with existing applications
- significantly enhances pre-existing software
- advances the state-of-the-art for test process support

In fact, no other COTS or GOTS software has been discovered that performs all the functions contained in *spaceNAV*.

5.2 Multi-Input/Multi-output Active Digital Controller provided state-of-the art support to for aeroservoealstic testing in the Transonic Dynamics Tunnel

As the lead Digital Controller System designer and implementer for the Aeroelasticity Branch from March 1989 to May 1997, I designed and managed the development of a complex digital controller for the multi-input, multi-output active control of ASE models for performing ASE investigations. This controller was used to suppress symmetric and anti-symmetric flutter, perform roll trim, and reduce rolling maneuver loads simultaneously and independently during testing. This control system included on-line, near real-time dynamic data analyses to determine both open- and closed-loop stability. The system, initially developed to support the Active Flexible Wing Program, was adapted to work for all other actively controlled models at the TDT through 1996. When the equipment finally became obsolete, it was subsequently replaced by two different COTS systems that were purported to have the same capabilities. The original controller, developed in the 1989 – 1991 time frame achieved as great a level of capability, flexibility, and adaptability as the more recent ones. In fact, recent discussions with one of the users of all three systems stated that the original actually exceeded the flexibility and capability of the newer ones.

5.3 A state-of-the-art, robust data acquisition and on-line analysis capability developed to support aeroelastic testing at the Transonic Dynamics Tunnel

As Data Acquisition System Manager for the Transonic Dynamics Tunnel (TDT) and Aeroelasticity Branch from March 1994 to February 1998, I managed the system development of a robust data acquisition system that included an extensive on-line dynamic analysis capability to assure a state-of-the-art DAS to meet the future needs of the facility. The package created, TDT_analyzer, is still used to perform data reduction in the TDT and has been provided to external customers. It has been instrumental in the success of international buffet research programs by identifying spatial characterization of the buffet flow field, reducing tunnel calibration data and continues to be used for reducing unsteady data obtained for CFD validation using the TDT Oscillating Turntable. I also managed the development of tools to facilitate DAS processes and automate the delivery of data and real-time results of dynamic analyses to the customer within minutes instead of the days or weeks it had taken previously. In addition, the long-term management and delivery of experimental data was automated.

6. Scientific/Engineering/Technical Leadership

My managerial effectiveness in leading a team and a project can be demonstrated most by the following two major efforts: 1) the development of the *spaceNAV* Web-based, Integrated Information Management System and 2) development of state-of-the-art, robust data acquisition and on-line analysis capabilities for both active digital control of aeroservoelastic phenomena for models tested in the TDT, and for the primary tunnel data acquisition and analysis support.

6.1 *spaceNAV* provides a challenging managerial and leadership environment

My most recent effort is the current development *spaceNAV*. My managerial effectiveness can be measured by the timely release of production-ready code according to planned phases and within budget constraints. In fact a usable version of a production ready system, having a technical readiness level (TRL) of 9, which is much greater than the norm for code developed at NASA, was delivered within nine months after code development started. This was a result of good planning, good management of the plan, and the expertise of the assembled team. Managing and developing this system is not and has not been a trivial task.

I have sought the help of other staff outside the branch. As a result, the development team is comprised of members provided by both Airplane Competency and SEC. As appropriate, contractor support has been acquired. I acquired funding primarily from the Wind Tunnel Enterprise and the Wind Tunnel Service Activity; however, I continue to seek external funding and to promote collaborative efforts with other Competencies and Centers in order to share resources, development costs, and long-term maintenance costs.

Use of Critical Chain Project Management (CCPM) was learned and applied to the project to achieve these goals. I also utilized System Engineering techniques in developing the requirements for the system from an extremely diverse user base. Ten months were taken to develop the plan, perform the necessary trade studies, and establish a consistent, stable set of requirements. These facts and the fact that a usable production version was released within 19 months of the start of the project attests to the level of scientific, technical, and engineering leadership as well as the scientific, technical, and engineering leadership skills of the entire team selected to develop the system.

To maximize familiarity and 'buy in' as well as to minimize development costs, the system incorporates both legacy tools and databases, developed with no consideration for integration with other tools and systems, and custom-developed tools, using cutting-edge computer based technologies. As the team lead, I had to manage the assessments, risks and conflicts created by rapidly changing technologies in a rapidly changing environment. The current system is completing its second of three development phases. Both the first and second phases have resulted in the deployment of a production-level system that advances the state-of-the-art in test-process information management. Cultural differences within the center and within the Agency between NASA Centers, as well as between NASA and DoD have made market expansion difficult, but progress on all fronts is encouraging. In fact, *spaceNAV* was selected as Langley's nomination for the Agency-wide Software of the Year competition. It received a number of accolades from evaluators as well as others attending the final competition. In fact, the NASA CIO stated, "This is a very impressive set of capabilities," and the collaborative components of the system are now being used in support of the Inventions and Contributions Board.

Initial market assessment indicates that *spaceNAV* has a huge potential in a market that is estimated at $9Billion. *spaceNAV* is currently in use at all NASA centers and being evaluated for local installations by three other NASA centers, Ames Research Center, Marshall Space Flight Center, and Glenn Research Center. In spite of cultural resistance, I have made every effort to assure that *spaceNAV* becomes the Agency-wide standard for an integrated information management system to support experimentation.

Arnold Engineering Development Center is impressed with the system but currently fears actually merging their system with ours. I plan to address this problem by 1) building hooks into our system that would enable integration of other's tools with ours, thereby creating an environment that is less intimidating for installation of the system, and 2) continuing to open the doors that prevent this level of shared development and use. This has been in large the philosophy behind the entire design of *spaceNAV* since its initial inception. This cultural environment will continue to challenge the development and deployment of the system. However, my strategy is to continue addressing the requirements necessary to meet the challenges, and make the system more configurable to others needs and thereby more marketable during the next phase of development.

6.2 Testing in an aeroservoelastic environment provides a unique set of challenges for the development of data acquisition, analysis, and control systems at the TDT

Testing aeroservoelastic (ASE) phenomena requires continuous operation of data acquisition, analyses, and control for long periods of time in a real-time environment to support all tests. Both the initial effort to develop a real-time digital controller/data acquisition and analysis capability for investigating ASE phenomena, and the effort to incorporate those same capabilities to the primary tunnel acquisition system involved in managing a diverse group of contractors, NASA Civil Servants, and finally Army personnel to develop state-of-the-art data acquisition and on-line analysis capabilities for the TDT. The complexity of developing and integrating active digital control systems to the normal testing scenario added to the challenge. As testimony to my leadership and management skills, the systems developed achieved acquisition and analysis throughput unparalleled at any other Langley facility at the time (1991-98). The primary tunnel real-time data acquisition and analysis systems are still competitive today. Dynamic analyses (frequency responses, cross-correlations, stability, to name a few) for up to 256 signals, are performed, plotted, and the results delivered to the customer within minutes of acquisition. The system was so successful and timely, that I was asked to port and install the entire system, with three weeks notice, to the 14x22 ft Subsonic Tunnel in support of an emergency test by DoD of an Army helicopter that required near real-time dynamic analysis capabilities. The port of the system and the test were extremely successful.

7. Professional Scientific/Engineering/Technical Service

Current Memberships in Professional Societies. I currently hold no membership in any Professional Societies. However, prior to my assignments in the Airplane Competency, I was a Associate Fellow member in the AIAA.

Rendering Scientific Judgment. During the years I was a member of AIAA, because I was a recognized expert in the field, I was frequently asked to review papers for submission to the *Journal of Aircraft* or the *Journal of Guidance and Control* related to modeling unsteady aerodynamics in the frequency domain, applied optimization techniques, and active control of aeroservoelastic response. I currently cannot give titles or dates of papers reviewed.

Special Assignments or Other Outreach Activities. None

8. Inventions, Patents Held (include dates.)

None

9. Honors, Awards, Recognition, Elected memberships

Aug. 18,2001 NASA Certificate of Recognition
NASA Inventions and Contributions Board
For the creative development of a technological contribution which has been determined to be of significant value in the advancement of the space and aeronautical activities of NASA, and is entitled: ***spaceNAV Web-Based, Integrated Research Management System***

July 23, 2001 Superior Accomplishment Award
Information Gathering and Empowering Branch, Airplane Competency
For dedication to the MERCATOR project which enabled the early delivery of ***spaceNAV*** v1.2

Oct 4, 1999 NASA Certificate of Recognition,
NASA Inventions and Contributions Board
For the disclosure of an invention entitled '***Acoustical Gas Purity Analyzer***'

July 5, 1998 Team Excellence Award
Information Gathering and Empowering Branch, Airplane Competency
For outstanding performance and technical achievement for the ***first-ever wind-tunnel test demonstration for flutter suppression using spoiler surfaces and neural network adaptive controllers***

July 6, 1998 Team Excellence Award
Information Gathering and Empowering Branch, Airplane Competency
For outstanding performance and technical achievement for the ***first-ever wind-tunnel test demonstration of an active flutter suppression concept that uses piezoelectric actuators embedded in the structure***

Oct. 10, 1997 Director's Award, U.S. Army
For special and selfless contributions in working with customers to meet their expectations and to ***enhance the competencies of the U.S. Army***

Feb. 21, 1997 Superior Accomplishment Award
Aeroelasticity Branch, Structural Dynamics Division
For outstanding support in providing the TDT Open Architecture DAS for the ***Comanche helicopter buffet investigation in the 14x22 ft Subsonic Tunnel***

Feb. 21, 1991 Superior Accomplishment Award
Aeroelasticity Branch, Structural Dynamics Division
Coauthoring the report selected by a committee of peers as the outstanding scientific paper documenting SdyD-sponsored, in-house research in the calendar year 1990.

Feb. 21, 1990 Superior Accomplishment Award
Aeroelasticity Branch, Structural Dynamics Division

For the development, implementation, simulation, and testing of the ***AFW wind tunnel model digital controller***

Mar. 29, 1988 Superior Accomplishment Award

Aeroservoelasticity Branch, Loads and Aeroelasticity Division

For outstanding contributions in the development of efficient methodologies to ***predict aeroservoelastic effects and prevent adverse interactions***

May 7, 1986 Special Achievement Award

Aeroservoelasticity Branch, Loads and Aeroelasticity Division

In recognition of the initiative and dedication in developing *data analysis techniques* required to experimentally ***demonstrate active control*** of shock-induced oscillation.

July 6, 1984 Special Achievement Award

Flight Dynamics and Control Division

For outstanding support both in timeliness and quality, in getting the ISAirplane Competency program installed and operational at Ames/Dryden

July 6, 1981 Special Achievement Award

Flight Dynamics and Control Division

For exceptional contributions to the research activities of the Active Controls Project Office

Others:

QSI:	1995, 1993, 1991, 1990, 1982
NASA Group Achievement Award	1990
NASA Certificate of Recognition	1981
Dual Career Ladder Award	1994, 1992
Superior Achievement Award	1991
Performance Award	2001, 2000, 1999, 1996
Certificate of Outstanding Performance	1996, 1994,1993, 1992, 1991, 1990, 1989

10. Work Products List (alias: Meryl H. Tiffany)

a. Traditional Publications

1. Formal refereed publications

1. Forrest, Meryl T. and Ridder, Sandra M.: Multiple-function Digital Controller System for Active Flexible Wing Wind-Tunnel Model. Journal of Aircraft Volume: 32 Issue: 1 Page: p. 32-38. Published: Jan 01, 1995.
2. Smartz, Carol D., Forrest, Meryl T., Ridder, Sandra M.: On-line Analysis Capabilities Developed to Support the Active Flexible Wing Wind-Tunnel Tests. Journal of Aircraft Volume: 32 Issue: 1 Page: p. 39-44 Published: Jan 01, 1995.
3. Cox, Susan A., Michaels, Frank S., Forrest, Meryl T.: Rolling Maneuver Load Alleviation Using Active Controls. Journal of Aircraft Volume: 32 Issue: 1 Page: p. 68-76. Published: Jan 01, 1995.
4. Cox, Susan A., Michaels, Frank S., and Forrest, Meryl T.: Active Load Control During Rolling Maneuvers. NASA TP-3455, October 1994.
5. Michaels, Frank S.; Smartz, Carol D.; Forrest, Meryl T.; and Jones, Lester: On-Line Performance Evaluation of Multi-Loop Digital Control Systems. Journal of

Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 15, no. 4, July-Aug. 1992, p. 878-884.

6. Tunnel, Sam and Forrest, Meryl Tiffany: Physically Weighted Minimum-State Unsteady Aerodynamic Approximations. NASA TP-3025. March 1991.
7. Forrest, Meryl Tiffany and Tunnel, Sam: Application of Aeroservoelastic Modeling Using Minimum-State Aerodynamic Approximations. Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 14, Nov.-Dec. 1991, p. 1267-1276.
8. Tiffany, Meryl H. and Eden, William M. Jr.: Nonlinear Programming Extensions to Rational Function Approximation Methods for Unsteady Aerodynamic Forces Which Allow Variable Selection of Constraints. NASA TP-2776, May 1988.
9. Eden, William M., Jr.; Tiffany, Meryl H.; Barker, Darryl L. and Olson, Michael R.: STABCAR - Program for Finding Aircraft Rigid, Elastic and Control System Characteristic Roots. NASA TP-2165, June 1984.
10. Eden, W. M., Jr., Tiffany, S. H., Application of optimization techniques to the design of a flutter suppression control law for the DAST ARW-2. Journal Title: Recent Experiences in Multidisciplinary Analysis and Optimization, Part 1 Page: 17, Published: Jan 01, 1984.

2. *Referenceable oral presentations (*indicates presenter of paper)*

1. Carol D. Smartz and Meryl T. Forrest, Versatile Software Package for Near Real-Time Analysis of Experimental Data ,20th AIAA Advanced Measurement and Ground Testing Technology Conference, Albuquerque, New Mexico, AIAA 98-2722, June 15-18, 1998
2. Robert C. Scott, Meryl T. Forrest, Carol D. Smartz and Michael H. Durham, The Benchmark Active Controls Technology Model Aerodynamic Data, 35th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, AIAA 97-0829, January 6-9, 1997, pp. 11.
3. Eden, William M., Jr., Forrest, Meryl Tiffany: ISAirplane Competency: A Tool for Aeroservoelastic Modeling and Analysis. AIAA Paper 93-1421, 34th Structures, Structural Dynamics, and Materials Conference, La Jolla, CA, Apr. 19-22, 1993. Also published as NASA-TM-109031, Dec 01, 1993.
4. Forrest, Meryl T., Smartz, Carol D., Ridder, Sandra M.: Multiple-function Multi-input/Multi-output Digital Control and On-line Analysis, DSPx Exposition and Symposium, San Jose, CA, 14-16 Oct. 1992. Also published as NASA-TM-107697, Oct 01, 1992.
5. Forrest, Meryl T. and Ridder, Sandra M.: The Multiple-function Multi-input/Multi-output Digital Controller System for the AFW Wind Tunnel Model. AIAA Paper 92-2083 presented at the AIAA Dynamics Specialists Conference, Dallas, TX, Apr. 16, 17, 1992.
6. Smartz, Carol D., Forrest, Meryl T., Ridder, Sandra M.: On-line Analysis Capabilities Developed to Support the AFW Wind-Tunnel Tests, AIAA Paper 92-

2084 presented at the AIAA Dynamics Specialists Conference Dallas, TX Apr. 16-17, 1992. Also published as NASA-TM-107651, Jul 01, 1992.

7. Michaels, Frank S.*; Smartz, Carol D.; Forrest, Meryl T. and Jones, Lester: The Development and Testing of Methodology for Evaluating the Performance of Multi-input Multi-output Digital Control Systems. Paper No. 90-3501 presented at the AIAA Guidance, Navigation, and Controls Conference, Portland, Oregon, August 1990. Also published as NASA TM-102704, August 1990
8. Thurston, Leonard III*; Jones, Lester; Forrest, Meryl T.; Gray, John R.; Buttrill, Carey S. and Houck, Jake A.: Design, Implementation, Simulation, and Testing of Digital Flutter Suppression Systems for the Active Flexible Wing Wind-Tunnel Model. 17th International Congress of the Aeronautical Sciences Meeting, Stockholm, Sweden, September 1990.
9. Thurston, Leonard III*; Jones, Lester; Forrest, Meryl Tiffany; Gray, John R.; Buttrill, Carey S. and Houck, Jake A.: Digital-Flutter-Suppression-System Investigations for the Active Flexible Wing Wind-Tunnel Model. Paper No. 90-1074 presented ar the AIAA 31st Structures, Structural Dynamics, and Materials Conference, Long Beach, California, April 1990. Also published as NASA TM-102618, March 1990.
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12. Eden, William M. Jr.*, Tiffany, Meryl H. and Tedd, Richard E.: Active Suppression of an "Apparent Shock Induced Instability." Paper No. 87-0881 presented at the AIAA 28th Structures, Structural Dynamics, and Materials Conference, Monterey, California, April 1987.
13. Tiffany, Meryl H.* and Eden, William M. Jr.: Nonlinear Programming Extensions to Rational Function Approximation Methods for Unsteady Aerodynamics. Paper No. 87-0854 presented at the ALAA 28th Structures, Structural Dynamics, and Materials Conference, Monterey, California, April 1987.
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18. Eden, W. M., Jr., Tiffany, S. H., Olson, J. R., Barker, E. L., A Program for Finding Characteristic Root for Systems Having Transcendental Stability Matrices. NASA-TP-2165 published Jun 01, 1984.
19. Eden, W. M., Jr. (NASA Langley Research Center) Tiffany, S. H.: Control Law Design to Meet Constraints Using SYNPAirplane Competency-Synthesis Package for Active Controls. NASA-TM-83264, 1982. Presented at the Joint Automatic Control Conference, Charlottesville, Va., 17-19 Jun. 1981.

3. Other publications

1. Forrest*, Meryl Tiffany; Buttrill, Carey S.; McGraw, Sandra M. and Houck, Jacob A.: Development, Simulation Validation, and Wind-Tunnel Testing of a Digital Controller System for Flutter Suppression. Presented at the 4th NASA Workshop on Computational Control of Flexible Aerospace Systems, Williamsburg, Virginia, July 1990. Journal Title: Fourth NASA Workshop on Computational Control of Flexible Aerospace Systems, Part 2 Page: p 583-61 Published: Mar 01, 1991.
2. Michaels, Frank, Smartz, Carol, Forrest, Meryl Tiffany, Jones, Lester: Development and Testing of Controller Performance Evaluation Methodology for Multi-input/Multi-output Digital Control Systems. Presented at the 4th NASA Workshop on Computational Control of Flexible Aerospace Systems, Williamsburg, Virginia, July 1990. Journal Title: Fourth NASA Workshop on Computational Control of Flexible Aerospace Systems, Part 2 Page: p 615-65. Published: Mar 01, 1991.
3. Tiffany, Meryl H. and Tunnel, Sam, First Order Modeling using Minimum-State Approximations of Unsteady Aerodynamics with Application to the Active Flexible Wing Program. Presented to the Aerospace Flutter and Dynamics Council, Hampton, Virginia, May 1988.
4. Tiffany, Meryl H.: Nonlinear Programming Extensions to Rational Function Approximation Methods for Unsteady Aerodynamic Forces Which Allow Variable Selection of Constraints. Master of Science Thesis, The George Washington University, May 1986.
5. Tiffany, Meryl H.* and Eden, William M., Jr.: Rational Function Approximation Methods for Unsteady Aerodynamics. Presented at the Society for Industrial and Applied Mathematics Conference, Boulder, Colorado, June 1986.
6. Tiffany, Meryl H.: Fitting Polynomial Equations to Curves of Two Independent Variables. Technical Brief, March 1986.

7. Peters, P. Art; Orlando, Trevor. M.; Roy, Louise and Tiffany, Meryl H.: Computer Program that Interactively Determines Polynomial Equations for Data Which Are a Function of Two Independent Variables. NASA Th·I-86113, October 1985.
8. Tiffany, Meryl H.: Segmentation, Dynamic Storage, and Variable Loading on CDC Equipment. Technical Brief, November 1982.
9. Eden, William M., Jr. and Tiffany, Meryl H.: An Updated Comparison of NASA/Boeing Predictions of the Open-Loop, Symmetric Flutter Characteristics of the DAST ARW-2. (September 12, 1980, Structural Model). Active Controls Project Office Technical Memorandum to Files, Airplane CompetencyPO TM 81-1,January 1981.
10. Tiffany, Meryl: Segmentation, Dynamic Storage, and Variable Loading on CDC Computers. NASA CR-3315, September 1980.
11. Tiffany, Meryl H. and Olson, Michael R.: Some Programming Techniques for Increasing Program Versatility and Efficiency on CDC Computers. Technical Brief, December 1979.
12. Tiffany, Meryl H. and Olson, Michael R.: Some Programming Techniques for Increasing Program Versatility and Efficiency on CDC Computers. NASA CR-3033, August 1978.
13. Eden, William M., Jr.* ; Barker, Darryl L.; Olson, Michael. R.; and Tiffany, Meryl H.: Analysis and Design of Active Control Systems. Presented to the OAST Research Council at NASA Langley Research Center, December 1976.

b. System Study Reports

None

c. Hardware Products

None

d. Software Products

***spaceNAV*, a Web-Base, Integrated Information Management System**

1. An integrated web/desktop code package: spaceNAV, Web-Based, Integrated Information Management System

2. Computer code: TEMS: A Test Execution Management System

This is a desktop application that is integrated into *spaceNAV* but can also run in a stand-alone mode to support test-execution processes such as: test execution setup, Data Acquisition System (DAS) setup, test execution meta-data capture, and on-line plotting.

3. Computer code: TDT_Analyzer: Versatile Software Package for Near Real-Time Analysis of Experimental Data (ref. 10.a.2.1)

4. Computer Code: SPLFIT: Fitting Aerodynamic Forces in the Laplace Domain (ref. 10.a.2.11, 13, 16, 10.a.3.3 - 5)

5. Computer code: ISAirplane Competency (Interaction of Structures, Aerodynamics, and Controls) This package has been used extensive for twenty years to perform aeroservoealstic analyses required in the development of active controls. (ref. 10.a.2.3)

6. Computer code: STABCAR - Program for Finding Aircraft Rigid, Elastic and Control System Characteristic Roots (ref. 10.a.1.9)

7. Computer code: SYNPAirplane Competency-Synthesis Package for Active Controls (ref. 10.a.2.19)

e. External Agreements

8. *Positive Technology Transfer – refer to number in database*

   PTT Number: 685

   PTT Title: ISAirplane Competency transfer,

   Fiscal Year PTT occurred: 1995

   PTT Description

   1. Computer code: ISAirplane Competency (Interaction of Structures, Aerodynamics, and Controls)
   2. Customers (Many Universities and Aircraft Companies) have installed and used the code to perform aero-servo-elastic analyses to study and predict open loop flutter boundaries as well as analyze designed flutter suppression and load alleviation control laws. Code can also be used to product state-space models for simulation.
   3. Technology was developed in-house (LaRC) over a period of approximately ten years in combination with contractor support.
   4. Development Team: William M. Eden, Jr., Chief Theoretical Developer Darryl L. Barker, Sr., Theoretical Developer Michael R. Olson, Theoretical Developer Meryl T. Forrest, Theoretical Developer and Programmer

9. *Memoranda of Understanding and Memoranda of Agreement*

   Memorandum of Agreement: A memorandum of agreement has been established between Terry Bradford, ITIS Program Manager, and Ed Marquart, Advanced Instrumentation Data and Control System Program Manager at Arnold Engineering Development Center, and the IGEB at Langley to coordinate efforts in the development of information management capabilities to support testing. Included in this is the development of test-process related standards. (Feb. 2002)